Mass Change Designated Observable Community Telecon
4/17/20 Q&A Transcription
Primary

Telecon Attendance

Karem Abdelmohsen	Achim Friker	John Ries
Kevin Ahlgren	Yuning Fu	Roelof Rietbroek
Donald Argus	Ichiro Fukumori	Matt Rodell*
Saniya Behzadpour	Andreas Groh	Jeanne Sauber*
Peter Bender	Richard Gross	Himanshu Save
Stephen Bennett	Thomas Gruber	Manuel Schilling
Srinivas Bettadpur	Ben Gutknecht	Pierluigi Silvestrin
Bernard Bienstock*	Felipe Guzman	Nico Sneeuw
Carmen Boening*	Patrick Heimbach	Tony Song
Jennifer Bonin	Bertram Heinze	Robert Spero
Lambert Caron	Jianliang Huang	Mohamed Sultan
Olivier Carraz	Vincent Humphrey	Matthieu Talpe
Kelley Case*	Adrian Jaggi	Mark Tamisiea
Sheng-wey Chiow	Steven Jayne	Byron Tapley
Jon Chrone*	Lee Kumanchik	K Vielberg
Francis Condi	Jennifer Lee	Pieter Visser
John Conklin	James Leitch	Susanna Werth
Shaun Deacon*	Jean-Michel Lemoine	David Wiese*
Carlos Deccia	Bryant Loomis*	Lisa Wood
Matthias Ellmer	Gunther March	Gaohong Yin
Elisa Fagiolini	Luca Massotti	Tony Yu
[ ] Fenoglio	Kirk Mckenzie	Nan Yu
Frank Flechtner	Benoit Meyssignac	Tom Yunck
Jakob Flury	Peter Nagel	Ed Zaron
Rene Forsberg	Christa Peters-Lidard	Meng Zhao
Samuel Francis	Rolf Reichle	Victor Zlotnicki*

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Questions and Answers

Q1 Srinivas Bettadpur: On slide 29, what is meant by "smallest feasible"
A1 Jon Chrone: The primary objective of that activity is to move into a spacecraft class that is smaller than GRACE and GRACE-FO. At the community workshop, we heard of several architectures in the cubesat/microsat realm, and this will be a focused activity to explore the smallest feasible SST architecture.

Q2 Byron Tapley: In the altitude scenarios presented, the 300 km altitude cases would not have a very long lifetime unless some drag compensation was performed. Can you explain how you reconcile this with the 500 km altitude cases? In the analysis of these systems, is this built into the reliability of the system as well as the cost to implement? Are you additionally considering the technology risk of such systems?

A2 Jon Chrone/Bryant Loomis/David Wiese: The lower altitude cases do require a drag compensation system, so the reliability, cost, and risk of that system will be explicitly considered in the value framework.

Q3 Pierluigi Sylvestrin: On Chart 27, the Baseline Science Objectives are from the United States Decadal Survey, but do not take into account work done in the framework of cooperation between NASA and ESA (the IGSWG report). Will you at some point compare these science objectives against those of the IGSWG report and other reports, such as the IUGG report?
A3: David Wiese: When we assess science value, we are explicitly addressing them against the science objectives of the US Decadal Survey. They do not take into account objectives from other reports. A good example of this is that the Baseline Science objectives all require monthly temporal sampling. If a set of science objectives were presented that required higher temporal sampling, such as weekly, then the science value for each architecture would subsequently change. Right now, there is an ongoing effort between NASA and ESA to combine the science objectives from the MCDO Study with those from the IUGG and IGSWG reports in a to-be-determined framework where performance can be assessed against a combined set of science objectives. Such a combination of science objectives can be leveraged in strategic partnership opportunities where each partner has differing science priorities.

Q4 Pierluigi Sylvestrin: On Chart 27, there are some arrows on the plot. What do the arrows represent?
A4: Jon Chrone/Bernie Bienstock: The intent of Chart 27 is to represent the cost to NASA inherent in any of the architecture options. The cost that is highlighted is that of a fully domestic implementation of that architecture option. The length of the arrow is representative of a notional workshare where the cost to NASA is reduced by leveraging a strategic international partnership. The MC team stresses the length of the arrows are notional, and the cost estimates are preliminary.

Q5: Pierluigi Sylvestrin: Right now, I see you consider architectures at 350 km altitude and 500 km altitude. The 350 km altitude cases would require six degree of freedom drag compensation and attitude control. There do exist solutions between these cases that could require, for instance, one degree of freedom drag compensation. Will you consider these other options?
A5: David Wiese/Bernie Bienstock. We have yet to explicitly considered these options. We definitely can, and should, consider both the 6 DOF and 1 DOF drag compensation options.

Q6: Nan Yu: At the community meeting last year, we presented a hybrid approach of an SST architecture and a gradiometer. In the charts presented, SST and gradiometer architectures are considered separately. Since this is a hybrid scheme, how do you plan to analyze such an architecture – do you have a plan to do such a study? Also, what errors are included in the gravity gradiometer simulations – can you make this information available to the community?
A6: David Wiese/Bryant Loomis: The hybrid architecture was not explicitly in the architecture tree presented, but should be in consideration. We do plan to run simulations with the gravity gradiometer, and can combine these with SST simulations. Regarding instrument errors, we are actively gathering these as input from the community, and welcome any input that can be provided. Specifically for the gravity gradiometer simulations, we are working to create the most

realistic simulations possible. The simulations done so far are preliminary and we are working to increase the fidelity of these simulations.

Q7: Srinivas Bettadpur: There is a great deal of "leveling" that needs to be done to make sure that all architectures can rise up to the same minimum level of performance in terms of lifetime, cost, etc., Will there be a public report coming out of this that includes all of the inputs that went into the decision and value framework?
A7: Bernie Bienstock: Since one of our tenants is transparency, the report will be available to the public in summary sense. We still need to determine the nature of that report. We are still working with headquarters to determine the process and the format of the report.

Q8: Roelof Rietbroek: Is it foreseen to provide near real-time products, and if so, does it affect the architecture cost?
A8: David Wiese: For the MCDO, since the Baseline Science Objectives of our SATM necessitate primarily monthly temporal resolution, it is not a strict requirement to have near-real time products. That doesn't mean that we cannot do it. We additionally have a set of "Goals" – in the goals, there are several science objectives that require weekly temporal resolution. So if an architecture can achieve a goal and provide weekly temporal resolution, then we can envision some sort of scheme where that architecture receives "Bonus Points" in the evaluation, and having the ability to provide near-real-time or low latency products can be considered in that domain.

Q9: Olivier Carraz: On Slide 21, for the estimation of the Science Value, when you assess against accuracy, it is linear, while when you assess against spatial resolution, it is squared. How do you cope with both of these?
A9: David Wiese: The performance of an architecture is fairly linear across space and time. And this linearity holds when the spatial scale is an area rather than a linear length scale. There is a lower layer of analysis where we can assess just against accuracy, or just against spatial resolution, or some combination, as we are doing here. We want to ensure that we understand the value system that we have created – that's always a worry when we have some large system like this – that in the end we don't understand what the final value represents. In this case, we do find that whether we assess against accuracy or spatial resolution, the final values and discrimination of architectures is not very sensitive to this choice. Further, we add that we actually are more sensitive to this choice when we treat the area as a linear length scale, and this gives us confidence that treating it as an area is the correct thing to do.